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DEPARTMENT OF PUBLIC WORKS.

OCT 4 1965

EDMONTON

CA2 ALZ 1 1914H35
Report of the Commission Appointed For
the Investigation and Enquiry Into



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The fatal accidents which occurred on November 20th in the mine operated by the Hillcrest Collieries, Ltd., near Hillcrest, whereby Pacifico Cimetta and William Thomas lost their lives, was caused by a runaway trip of cars. The deceased persons were apparently riding on the trip when the rope broke with the result that the cars ran back down the incline and becoming derailed, crushed both men. Thomas was riding on this trip contrary to instructions.

The fatal accidents which occurred on November 25th at the mine operated by the Department of Natural Resources of the Canadian Pacific Railway Company, near Bankhead, whereby N. Morello and W. Packny lost their lives, was caused by a fall of roof. The deceased were mining coal in pillar No. 4 C, 3, south, when the roof and part of the pillar fell out, burying them. The body of Packny was recovered, but before the other body could be recovered a very large fall of roof took place with the result that it was impossible to locate this body.

The fatal accident which occurred to Frank Gregory on December 12 at the mine operated by the West Canadian Collieries, Ltd., near Bellevue, was caused by Gregory having his head crushed between a locomotive and the timbers on the side of the road. Gregory was acting as brakeman and was sitting beside the driver on the front end of the locomotive. He heard someone shout and in looking around put his head out with the result that he was knocked off the locomotive and was crushed against the side of the road.

The explosion which occurred on June 19th at the mine operated by the Hillcrest Collieries, Ltd., at Hillcrest, whereby 189 persons lost their lives was caused by an explosion of gas and coal dust. We have been unable to ascertain the cause of the explosion.

Judge A. A. Carpenter of the District Court at Calgary was appointed a commissioner under the authority of the Act Respecting Inquiries Concerning Public Matters, being Chapter 2 of the Statutes of Alberta, 1908, to conduct an investigation into the cause of this explosion and I herewith attach copy of his report.

All the bodies were recovered with the exception of one which is supposed to be under a very large cave in the upper workings of the mine.

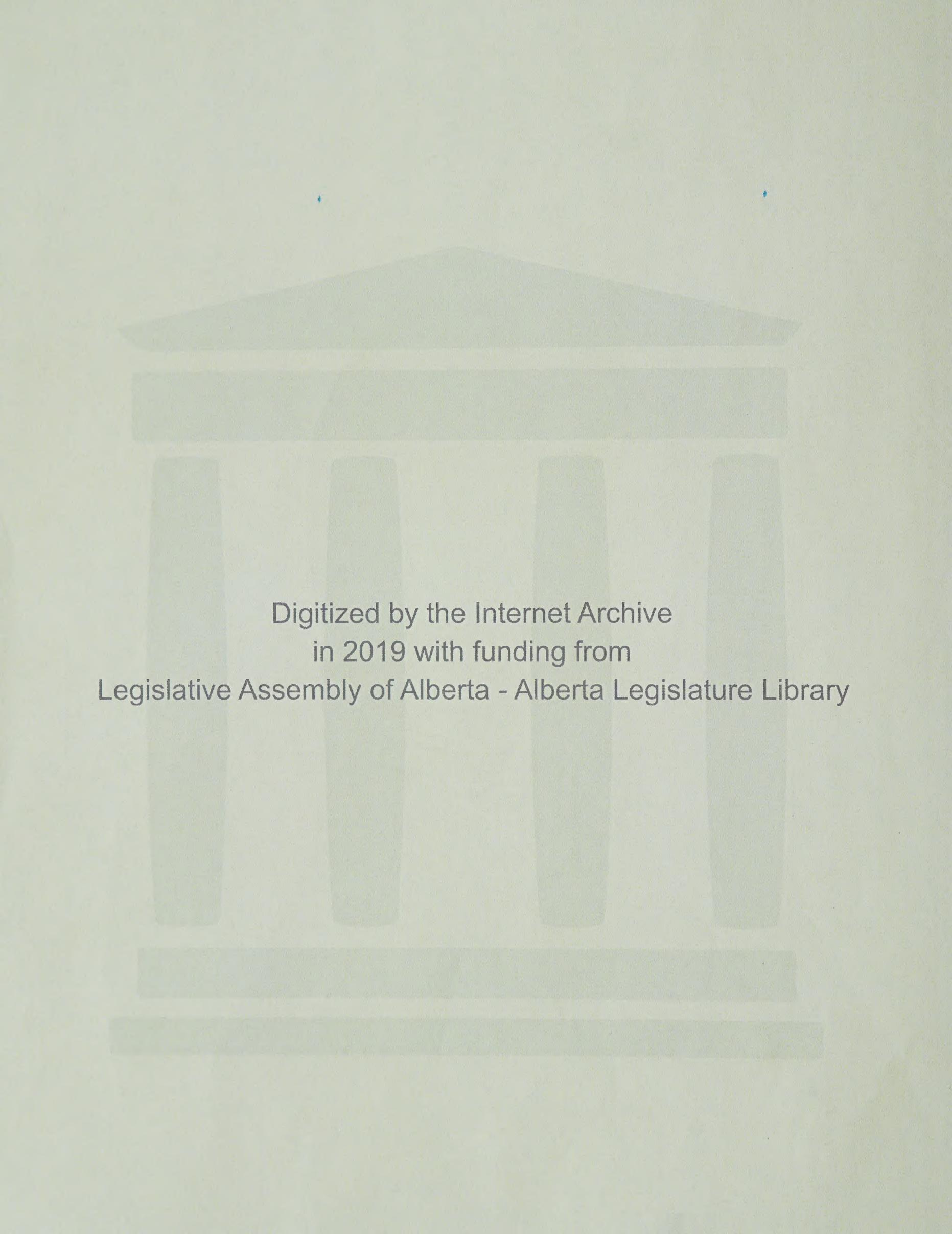
Following is a copy of Judge Carpenter's report:

CALGARY, 20th October, 1914.

THE HONOURABLE CHARLES STEWART,
Minister of Public Works,
Edmonton, Alberta.

SIR,—

I have the honour to submit herewith, my report based upon the evidence taken at the inquiry into the Hillcrest Mine disaster, in pursuance of the power vested in me by the Commission bearing date the 24th day of June

A faint, light-colored watermark of the Alberta Legislature building is visible in the background of the page. The building is a large, classical-style structure with a prominent central dome and multiple levels of columns and arches.

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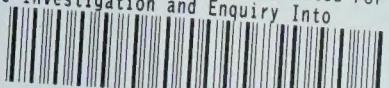
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A.D. 1914. I would ask you to be good enough to place the report before the Lieutenant Governor in Council.

The hearing of the evidence was begun by me on the 2nd day of July of this year and continued until the 11th day of that month inclusive. The very fullest opportunity was given to the public as well as to all parties interested, to give under oath any evidence or information they desired to give, and throughout the inquiry it was constantly intimated by me that no one who desired to give evidence, would be denied that opportunity, and further that if anyone could give the names of any parties whose evidence in their opinion, would be of any assistance to the Commission, upon the handing in of the names of such parties to the counsel appearing for the government, they would be at once summoned before the Commission and required to give evidence.

All the evidence available was taken, and what might be said to be a fairly thorough inspection of that part of the mine where the explosion was supposed to have occurred, was made by the Commission.

The report has been delayed owing to not having received the result of the tests of coal dust that were to be made by the United States Bureau of Mines, which tests it was agreed by counsel should be taken into consideration in making this report.

In addition to Mr. W. M. Campbell, K.C., who appeared on behalf of the government of the Province, Mr. Colin Macleod acted for the owners of the mine, Mr. J. R. Palmer for the Miners' Union, and Mr. A. J. Kappalle, of Vancouver, for the Royal Italian Consul, representing the Italian subjects who were among the victims of the disaster.

I am forwarding under separate cover the evidence taken at the inquiry, together with the various exhibits put in in evidence.

I have the honour to be, Sir,

Your obedient servant,

(Signed), A. A. CARPENTER,
Commissioner.

REPORT OF THE COMMISSION APPOINTED FOR THE INVESTIGATION
AND ENQUIRY INTO THE CAUSE AND EFFECT OF THE
HILLCREST MINE DISASTER.

The explosion in the mine of the Hillcrest Collieries, Limited, occurred, according to the evidence taken at the enquiry, at about 9.30 o'clock in the morning of the 19th of June this year. At the time of the explosion there were 235 employees of the company in the mine. Of these, 189 perished, the only ones saved being those in the northerly portion of the mine, in the workings of what is referred to as Number 1 North Level, where the effect of the explosion was but slightly felt.

The scope of this enquiry was by the terms of the Commission, to determine as far as possible the cause and effect of this disaster. To follow out the objects of the enquiry, the possible causes of an explosion in a mine of this kind have first to be considered. It is then necessary to arrive as far as possible at the actual condition of the mine immediately prior to the explosion both in regard to the ventilation of the mine, the presence of gas, the condition of the mine in regard to dust, and the character of that dust as regards explosiveness, and any other conditions that might give rise to or contribute to the cause of the explosion. It is also necessary to consider what care the officials of the mine had exercised prior to the explosion, both in the supervision of their employees and generally in the operation and working of the mine. Finally the nature and seat of the explosion, if possible, must be determined.

In general it may be said that with the exception of what is known as a blown-out shot, all mine explosions must originate with the ignition of gas. In the case of a blown-out shot, however, dust may be ignited directly, and given dust in sufficient quantities and of a sufficiently explosive char-

acter, an explosion may result, and a blown-out shot, may of course, result in ignition of the gas. Apart from this, the ignition of gas may be caused in a number of ways. An open flame such as from a match or a naked lamp, a defective safety lamp, the spark from a pick or tool, or the sparking of electric wires or motors may be said to be the most common causes of the ignition of gas in a mine. A fall of rock of such a character as will give off a spark upon falling, and which draws down with a pocket of gas may also cause this ignition. The mere ignition of gas however, doesn't necessarily lead to a mine explosion. A great deal will depend on the explosive character of the firedamp, and the condition of the mine air and workings in respect of gas, dust and moisture.

As regards the possibility of the Hillcrest explosion being originated by a blown-out shot, it is agreed by all the witnesses, that that cause may be eliminated in the present enquiry. All shots in the mine are fired by the examiner by means of an electric battery and cable, and the examiner who alone would have fired the shots in that portion of the mine where the explosion did occur was found with the firing cable wound around his body and the battery key in his pocket. The other examiner on duty in the mine was among those in the workings of Number 1 North Level, all of whom were saved.

In this mine no naked lights are allowed, the lamp in use being the Wolf safety lamp, and these lamps are examined by the examiner before being given out to the men, and were on the morning of the explosion examined by the two examiners on duty at that time. At the same time a safety lamp may become defective through improper handling, as for instance if it isn't held erect and comes in contact with the flame, the glass may break, or it may be broken by means of a pick or some tool or by a fall or rock. The probabilities are against a defective safety lamp being the origin of this explosion, but that possibility cannot be eliminated.

The lighting of a match is a cause which also cannot be eliminated. It is a contravention of The Mines Act for men to take matches, pipes or tobacco into a mine of this character, and the management of the mine have the right to search the men for such articles before they go down into the mine, but whether such a search was made or not in this case there is no evidence. Both in this case and in the case of a defective safety lamp the personal equation must largely come in, and it must be remembered that a case of carelessness or foolhardiness on the part of anyone employed in such a mine may result in an appalling disaster.

With regard to a fall of rock such as has been mentioned, obviously no conclusion can be arrived at. The rock formation in this mine is the same as at Bellevue, where some four years ago, a number of explosions, the origin of which was attributed to the sparking emitted upon such a fall, occurred. Evidence was given by two witnesses, (pages 57, 58 and 199 in the evidence) that they had seen a fall of rock cause sparks, some four years ago, in the old workings of this mine.

There is also evidence given as to the striking of sparks by a pick. Given a proper mixture of gas and air an ignition might follow from such a cause.

As to the sparking of electric wires or motors, there were three electric pumps in Number 2 slope, placed respectively one hundred and thirty feet, nine hundred feet and fifteen hundred feet down the slope and the cables for driving these pumps ran down this slope. The report of the electrician shows that the wires were properly insulated and whatever the effect might be from the danger of these cables and pumps, with the system of ventilation that apparently prevailed in this instance, there is no suggestion that the explosion originated in Number 2 slope and that cause of ignition may, I think, be eliminated.

The question of the ventilation of the mine is manifestly one of great importance to be considered in connection with this investigation. There is always a certain amount of gas being generated from the coal in a mine of this description, particularly from the working faces, and it is through the proper ventilation of the mine and the proper direction of the air currents, that this gas is carried off, freeing those working places from the undue presence of gas which otherwise would constitute a constant menace to the safety of the mine.

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The exact details of the ventilation system of this mine were known only to the Mine Manager, Mr. Quigley, and the Overman, Mr. Taylor, and both of these officials were among the victims of the disaster. Under the provision of the Alberta Mines Act the mine operators are not required to keep in their office a plan of the ventilation system of the mine, our Act therein differing from the Coal Mines Act of Great Britain, which makes it obligatory upon the company to keep such a plan in its office. Consequently there was no plan kept of this ventilation system, and as a consequence of the death of these officials, the only evidence that was available in this regard was that of the surviving examiners. At the enquiry a plan of the mine was produced and upon it the examiners traced as nearly as they could the direction of the air currents in their respective districts. While the production of a plan of the ventilation system, as is required to be kept under the provisions of the British Act, would have beyond doubt been more satisfactory, I think on the whole, the evidence of the examiners presents a fairly accurate idea of the ventilation system of this mine.

By way of explanation, it may be said that there are two entrances to the Hillcrest Mine, one called the Rock Tunnel, leading to Number 1 slant or slope, and to the new slant, and the other, which is designated as Number 2 slope or slant. All the coal from the workings above, or rather east and south of Number 1 slant, is taken up through the Rock Tunnel and this part of the mine for the sake of convenience is referred to as Number 1 Mine, while the coal from all the other portions of the mine is taken up the Number 2 slant or slope, and these portions of the mine are, for the same reason, referred to as Number 2 Mine. In reality, however, all the workings are connected and comprise but one mine.

There were two fans employed in the ventilation of the mine. One, an electrically driven fan of the Sheldon-Sirocco type, placed a little to the south of the Rock Tunnel, acted as an exhaust fan, while the other, a steam driven fan, located a little to the north of the entrance to Number 2 slope, was used as a forcing fan. This latter fan, at the time of the accident, was forcing the air into the workings of that part of the mine known as Number 1 North Level. The return air from Number 1 North Level, apparently joined the intake air going down Number 2 slope. These combined currents travelled down this slope to Number 2 South Level, along the level to the face, returning back along the working faces of Number 2 South, to Room 31, and thence to the exhaust fan through an overcast over the new slant, after ventilating the working places of Number 1 South Level. Another current passed down Number 1 slant, returning along the counter, after having ventilated the places in the level off this slant, and the places above the slant where the pillars were being extracted. The current going through the Rock Tunnel to some extent split at the junction of this tunnel with Number 1 slant and the new slant, a portion travelling down the new slant as far as a stopping at about the second cross-cut in Room 31. That this current, however, did not play any important part in the ventilation of the mine may be judged by the fact that no measurement apparently was ever taken of the air passing down the new slant. The evidence was that a certain amount of this current leaked through this stopping into Room 31, and from these joined the air current ventilating the workings of Number 1 South Level.

The workings below Number 2 slope as far down as Number 3 South Level according to the plan marked by the examiners appear to have been ventilated, at least to some extent, by a split of the air current down Number 2 slope, but below Number 3 South Level, the workings were ventilated by means of compressed air and it was almost universally agreed, I think, that the use of compressed air for ventilation purposes in a mine of this character, was objectionable.

The turning of the return air current from Number 1 North Level, in with the intake current travelling down Number 2 slope and used to ventilate the balance of the workings of Number 2 mine, was severely criticized by Mr. Fraser, the expert witness for the miners and by others, owing to the fact that this would mean that air already vitiated through the ventilation of one portion of the mine, would be turned in to mix with the fresh current of air used to ventilate another part of the mine. It is true that there was an overcast crossing Number 2 slope, a little above the junction of this slope and Number 1 South Level, and had the return air from Number 1

TECHNICAL NOTES

North Level, been carried through this over cast to the surface no objection in regard to this part of the ventilation system could have been raised, and it was at least suggested by counsel for the Company, that this over cast was probably in use at the time of the explosion. The evidence however, I think, is clear, that this overcast was not being used at that time, and it seems to have been a fact that this return current from Number 1 North Level, did travel down Number 2 slope and from there along with the intake current down the slope through the other portion of the workings of Number 2 mine.

Measurements of the quantity of air taken into the mine at the different intakes are made once a week by the Overman, and the last of these measurements before the disaster, was taken on the 16th of June. On that day, these measurements show that 14,500 cubic feet of air per minute were being forced into the workings of Number 1 North Level, 24,000 cubic feet were being taken in down the Number 2 slope and 54,600 cubic feet were being drawn down Number 1 slant. The conclusion Mr. Fraser arrived at, seems to be that in taking the volume of air coming down Number 2 slope at 24,000 cubic feet, the Overman had included the return air from Number 1 North Level. I cannot come to this conclusion myself. To do so would, I think, be to impute a species of fraud to this official and a manifest attempt on his part to give a false idea of the ventilation of the mine. I do not think there is anything to warrant the adoption of such a view. It is apparent from the measurements that there was a sufficient quantity of air passing through the mine, to insure proper ventilation, provided the air was properly distributed.

By the Mines Act it is provided that every mine shall be divided into districts or splits of not more than seventy men in each district and each district shall be supplied with a separate current of fresh air. There was a very considerable difference of opinion as to the definition of the word "split." Mr. Fraser adopted the view that the term as used, has the same meaning as the term "ventilation district" used in the British Coal Mines Act, and, as to Number 2 mine, it was suggested by him that Number 1 North Level, and Number 2 South Level, were both on the same split. On the other hand Mr. Drinnan, the company's expert, was inclined to give a much wider, or at least a more vague, interpretation of the term, and, in his opinion, Number 1 North Level, and Number 2 South Level, comprised two distinct splits. Mr. Brown, the company's manager, was of much the same opinion, and I might say here that if the return current from Number 1 North Level, travelled through the over cast, over Number 2 slope, there would be no possible doubt but that there were two distinct districts or splits in Number 2 mine. I am distinctly under the impression, however, that at least the intention of the Alberta Act was that the term "district" or "split" should receive the same meaning as the term "ventilation district" in the British Coal Mines Act.

Assuming for the moment that there were two distinct splits in Number 2 mine, it still seems that there were considerably more men employed in these workings than the Act sanctions. It is to be regretted that the reports kept by the company do not give very definite information as to the number of men employed in the various parts of the mine. The explanation given was that the men, with the exception of the miners, are often moved from one part of the mine to another. This is quite conceivable, and is indeed undoubtedly the case, but without more definite track being kept of the whereabouts of the men than was apparently done here, it is difficult to see how the section of The Mines Act limiting the number of men in each district or split, can be observed.

The estimate of Mr. Fraser, as to the number of men employed in Number 2 mine, exclusive of Number 1 North Level, in view of the evidence, is, I think, excessive. It is impossible to fix exactly the number of men employed in Number 2 mine at the time of the disaster. The rescue parties, as may be readily conceived, paid little attention to the location where the bodies of the victims were found, and even the location of the bodies would not be conclusive in this regard, as there is little doubt but that many of the men, after the explosion, left their working places, in an attempt to escape, before they succumbed to the effect of the afterdamp.

According to the figures submitted by the company as showing the number of men checked into the mine, on the morning of the disaster, there

were fifty-nine men in Number 1 mine and one hundred and seventy-six in Number 2 mine. All of the men in Number 1 North Level, forty-six in number, were saved so that in the remaining portion of Number 2 mine the company's figures would show that there were one hundred and thirty men. The evidence bears out, however, the company's explanation that the men were moved about the mine after being sent into it, as while the figures show that there were three tracklayers in Number 2 mine, and none in Number 1 mine, the evidence is that one of these men was killed in Number 1 mine. Again while there is no strict evidence on the point, it appears that the number of buckers found in Number 1 mine was very considerably greater than the company's figures show. I think that possibly an extreme estimate of the men employed in Number 2 mine apart from Number 1 North Level, would be 120 and it was probably less. Assuming that there were 120 men there at the time of the disaster, it will be seen that the quantity of air coming down Number 2 slope would be at least sufficient to allow the required two hundred cubic feet per man that is required by the Act. It is true that this does not take into consideration the fact that there were some horses in the mine at the time, but neither, however, does it take into account the compressed air below Number 3 South Level, nor the air going down the new slant. On the other hand if Number 2 mine was all in one district or split, there would be considerably over the required 200 cubic feet per man. Upon the whole it appears that while the Act appears to have been violated so far as employing more than seventy men in a split or district, it is probable that there was a sufficient volume of air in this portion of the mine to allow the requisite amount per man as is required by the Act and the evidence does not warrant any finding that the noncompliance of the Act in this regard contributed to the explosion.

It may be taken for granted, I think, that both the ventilating fans were properly working up to the time of the accident. Any stoppage of the electrically driven fan would have been at once noticed by the man in charge of the switch board at the power house. So far as the evidence goes it doesn't seem that any notice had been given to the steam driven fan for about half an hour before the occurrence of the explosion. The working of this fan could be heard by the hoistman in the engine house, provided the window of the engine house was open, but the fan itself could not be seen from there. While there is nothing to suggest that this fan was not working at the time of the disaster, and the evidence all goes to show that it was, it does seem that closer oversight should have been kept upon this fan, when its stoppage might cut off the entire ventilation of one portion of the mine. The attachment of an automatic indicator to the fan would avoid any such danger.

In regard to the turning of the return air from Number 1 North Level down Number 2 slope, the weight of evidence I think, goes to show that the system of ventilation in this regard, if not absolutely objectionable, was at least not to be commended, but while this is so, there is nothing to show that this practice contributed any to the cause of the explosion. Neither can it be said that the use of compressed air in the workings of Number 2 slope below Number 3 South Level, is accountable in any way for the disaster. It was practically admitted, I think, that the explosion did not originate in this portion of the mine.

With regard to the operation of a hand fan in Number 1 North Level, and in Number 2 South Level opposite the raises, the evidence shows that the mine had not been working during the two days immediately prior to the day of the disaster, and the evidence of the Examiner, William Adlam, is to the effect that these raises were full of gas. The fan boys who operated the hand fan went into the mine at the same time as the miners, and consequently it is to be presumed that after the miners had begun work, if there were men working at the face of the entries, the gas from the raises would be driven over them and that such a practice is bad is admitted by a number of expert witnesses. So far as the question concerns Number 1 North Level, it is of no importance as there was no explosion in that part of the mine, and in regard to Number 2 South Level, it must be remembered the fan would start to expel the gas from the raise when the morning shift went on, that is at seven o'clock in the morning, and the explosion did not occur until two and a half hours afterwards. There is again nothing I think to show that the explosion originated at this point nor I think did any of

the witnesses so contend. And as to the general practice of using these fans, under such conditions, it must be said that Mr. Hudson, representative of the Dominion Department of Mines, and a man of wide experience in mining matters was unwilling to criticize their use.

It appears from the evidence, that while the system of ventilation in some details has, and, I think, with some reason been criticized by some of the witnesses giving evidence at the enquiry, so far as the men of the mine were concerned, there seems to have been only one opinion in regard to the ventilation and that was, that the ventilation was good so far as their own particular working places were concerned. There was apparently no complaint whatever by the men in that regard.

It is true that a month or more before the disaster the conditions were not so good. Evidence was given that travelling caps, that is the existence of such an amount of gas in the ventilating current as would show a flame in a test with a safety lamp, were found. But this condition was before the driving through of Room 31, and upon the completion of that work, this condition was remedied. Since that time, and up to the time of the disaster, there had been no complaints on the part of the men, nor had there been anything that would indicate any unsatisfactory condition in the ventilation of the mine. The report of the Pit Committee, representing the miners, made on the 18th of May, just a month before the disaster, sets out that they found the ventilation good and general conditions good, and the evidence is to the effect that between that time and the time of the disaster, there were no circumstances that would lead any one to believe that the condition of the mine had, in the meantime, undergone any change. Notwithstanding the fact therefore that the system of ventilation is, as I have said before, in a number of details open to criticism, the evidence does not warrant me, I think, in attributing the cause of the explosion, to any faulty ventilation of the mine.

The question of gas in the mine must be intimately connected with the question of ventilation. At the same time the presence of gas is not necessarily an indication of an inefficient system of ventilation. The accumulation of gas may arise from the fact that the brattices have not been led up sufficiently to the faces of the workings and consequently the air current is not conducted sufficiently near the faces so as to carry away the gas. And in a mine of this nature it may be said that generally there is always more or less gas.

In any mine where inflammable gas has been found within three months, an inspection of the roadways leading through the mine, and the working places must, under the provision of The Mines Act be made within three hours before each shift goes to work in the mine. During this inspection a test is made for gas, and the examiner makes a report as to the condition of the mine, such report being recorded in a book kept for that purpose and a copy of this report is posted up immediately in a conspicuous place at the mine. The last inspection of this nature, made before the explosion, was by the Examiner, William Adlam, who went into the mine about ten minutes to four and came out at twenty minutes past six o'clock on the morning that the disaster occurred. His report showed the presence of gas in working places, 2, 5, 12, 17, 7, 8 and 43. Of these places, 2, 12 and 17 are in the workings of Number 1 North Level, 7 and 8 in Number 3 South Level, and 5 and 43 in Number 2 South Level. The Examiner swears that in accordance with his duties in that regard he fenced off these places so that the miners would not go into them until the gas had been cleared out.

It is the custom for the brattice men, who attend to the placing of the brattices, so as to conduct the air current up to the working face and so clear those places of gas, to go into the mine a half hour or so before the shift goes in. The examiner or examiners on duty at that hour gives or give the orders based upon the report of the examiner who has just made his inspection. The lamps of the brattice men are examined by the examiners who have gone on duty, and in this case John Ironmonger swears that he examined the lamps of the brattice men when going into the mine. It is, I think, only fair to assume that the brattice men on this morning, went in as customary to attend to the fixing of the brattices so as to rid the mine of the gas indicated in the examiner's report. If the brattice men

attended to their duties, and it is only fair to assume they would do so, the mine with the exception of the raises, should have been speedily freed of gas.

I confess that the evidence of Adlam somewhat bewildered me in regard to the quantities of gas referred to in his report. My impression from his evidence given in the first instance was that there were comparatively only small quantities of gas in the places indicated in his report. Upon his being recalled his evidence gave me the impression that the quantities of gas were much greater than his evidence led me to believe in the first instance and I am somewhat at a loss to reconcile his different statements in this regard. Adopting his later statement, it is evident that the raise in Number 1 North Level, and the raise in Number 2 South Level, were, as he says, full of gas. With these raises full of gas it does seem that it would have been advisable that these places should have been cleared before the miners entered the mine. Such a course at least would have avoided an element of danger that had to exist if the raises were being cleared after the miners had gone to work. Notwithstanding, however, that the gas was in the quantities I have mentioned, Adlam says that he did not consider that there was an unusual amount of gas in the mine that morning, and Mr. Hudson, who heard all the evidence, expressed his opinion that nothing indicated an undue amount of gas at that time.

The theory of Mr. Fraser was that the explosion originated in the workings of Number 2 South Level. If such were the case, except so far as it would tend to vitiate the air current going through Number 2 South, the gas in all the working places but 5 and 43 may be eliminated so far as this phase of the investigation is concerned. The mine had been idle on the 17th and 18th of June, the two days immediately before the day of the disaster, but the ventilation system with the exception of the working of the hand fans was in full operation and a perusal of the examiners' reports for those days, shows the mine to have been more than ordinarily free of gas during that time. There does not seem to be anything in the evidence in regard to the presence of gas in the mine that assists in leading to any conclusion as to the cause of the disaster nor to lead to condemnation of the general system of ventilation then in use in the mine.

One of the great sources of danger in a mine lies in the presence of dust, provided that dust is of a sufficiently explosive or inflammable nature. The really dangerous dust is the fine impalpable dust that clings to the roof and walls and timbers used throughout the mine. This may, if of a sufficiently explosive character, be ignited by a blown-out shot or by contact with a flame of sufficiently high temperature. In the course of an explosion it generates its own gas and will rapidly spread through a mine where there is sufficient dust to feed the explosion, but the dust, if sufficiently wet loses for the time being its explosive character.

In regard to the character of the dust in the Hillcrest mine, both counsel for the mine owners and the miners at the enquiry agreed that I should avail myself of the result of the tests made by the United States Bureau of Mines as to the explosibility of samples of dust taken from the Hillcrest mine. Without adopting any technical language it may be said that these tests show that the dust in this mine is of a fairly highly explosive character and the dust would ignite by a blown-out shot or by an ignited pocket of gas. It may be said that the general supposition of practically all of the witnesses at the enquiry was that the dust was of this character, so that the evidence has all been given based upon this supposition, which has now been confirmed by these tests.

As to the quantity of dust in the mine, the evidence is to some extent conflicting. Mr. Aspinall, who was the Government Inspector of Mines for the district in which the Hillcrest mine is situated, a year or so prior to the disaster, stated that he would consider this a fairly dusty mine, and in his report of the 4th of July last year calls attention to the fact that there was considerable dust in certain places in the mine, but apparently the only immediate danger that was anticipated from the presence of this dust was from shot-firing and it seems that shot-firing was discontinued in the places complained of. On the other hand the evidence of nearly all of the men working in the mine who gave evidence was to the effect that prior to the explosion they would not consider this a dusty mine.

With the exception of Number 1 slant the main roadways are more or less wet. Number 1 North Level, may be said to be distinctly wet and so with Number 2 slope below Number 2 South Level, and this may also be said to apply to the northern part of Number 2 South Level. One of the means adopted to prevent the spreading of the dust explosions in a mine is by the watering of and keeping damp the main roadways in a mine although this system is not universally approved of, as nothing but the thorough soaking of the dust eliminates the danger. This system of dealing with the dust, however, has not been adopted in any of the Western Provinces and it cannot be said therefore that the company failed in their duty in not adopting such a course. The main roadways, as I have just said, were with some exceptions, wet, and it seems to have been the general opinion that the watering of the rooms and the working faces would be impracticable.

I do not think that the evidence is such as to show that the company had any reason to believe that there was a dangerous quantity of dust in this mine. At the same time it must be remembered that an explosion such as occurred on the 19th of June, would undoubtedly increase this dust and undoubtedly means should be adopted now by the company to eliminate as far as possible the danger from this dust by removing it as far as practicable from the mine or adopting any precautions that can be adopted to prevent the spreading of a dust explosion should it occur. It is needless, I think, to say that the greatest care should now be exercised in regard to shot-firing in the mine. A blown-out shot, as has been pointed out, is the one means of igniting dust directly, and blown-out shots are by no means uncommon in a mine. It is very questionable whether shot-firing should not be entirely eliminated from this mine until conditions in regard to dust are very much improved from what they were at the time of this enquiry.

Some criticism was made by Mr. Fraser in regard to the kind of stoppings that were adopted by the management of this mine. It was suggested that had the stoppings been of a more permanent nature the explosion would not have spread to the extent that it did. This however seems to be a debatable question and the evidence shows that the stoppings in this mine were of the same character as are used in the mines throughout the Western Provinces. There is nothing in the evidence to lead me to the conclusion that if the stoppings had been of a different character the extent of the explosion would have been curtailed. There is evidence indeed to the effect that substantial stoppings by first confining the forces developed by the explosion might have eventually rendered the disaster greater even than it was.

Apart from the matters I have already dealt with, there does not appear to be anything in connection with the management of the mine, nor in the care taken by the company in its operations that could have led or contributed in any way to the disaster.

The initial cause of the explosion does not appear to be ascertainable. I have, almost at the outset of this report, mentioned the ordinary causes of ignition of gas in a mine. Shot-firing having been eliminated, the explosion must of course have originated from the ignition of gas, but by what means there has been absolutely no suggestion. Certain of the ordinary causes of ignition have been or may be eliminated here, but there is no means whatever of fixing upon which of the remaining causes it was that started the explosion.

As to its character, Mr. Drinnan was of the opinion that it was almost entirely a gas explosion and that dust contributed very little if any to it. With this exception, however, the expert witnesses all were of the opinion that it was a gas explosion augmented by the ignition of dust and that dust played a considerable part if not the greatest part in the explosion. The finding of a very considerable amount of coked coal dust was one of the facts that was relied upon by those who advanced this latter theory and in view of the result of the tests of the dust, I think this view is the most reasonable one to adopt.

It is impossible also to determine the seat or place of origin of the explosion. Mr. Fraser expressed the opinion that it occurred in the workings above Number 2 South Level, but he is unable to point out any exact locality. The other experts were unable to come to any conclusion in this regard. In certain parts of the mine it can be said that the explosion did not originate, but apparently the place where it did originate cannot be determined.

It will be seen from the foregoing portions of this report, that the course adopted by the management of the mine in relation to the ventilation thereof, and other matters closely related to the question of ventilation, was apparently either objectionable or at least open to criticism, but the evidence does not go so far as to show that this was responsible for the disaster. And it must be said that Mr. Hudson stated that he would not attempt to criticize the ventilation of any mine from the plan, and without having the advice of the men who are conducting the ventilation from day to day. As one of the witnesses states it, so far as this explosion is concerned, something must have happened in the mine of which we have no evidence.

The only conclusion therefore, that I can arrive at, as a result of the whole evidence adduced at the enquiry is that the disaster was caused by an explosion of gas, the origin and seat of which is unascertainable, this explosion being augmented by the ignition of dust throughout the mine.

Although the cause of the explosion cannot be determined, a consideration of the facts and circumstances brought out by the evidence at the enquiry suggests certain recommendations which it is submitted, may lessen the extent of the danger that was shown to be attendant upon the operation of this mine. Most of these have already been suggested in this report.

Attention has been called to the fact that the Number 2 fan was without direct supervision, for about half an hour before the occurrence of the explosion, and it has been pointed out that the stopping of the fan for any considerable length of time might be attended with serious consequences. It is suggested that such a fan should be either under the constant supervision of some one or should have an automatic indicator attached thereto in lieu of such personal supervision.

The question of shot-firing in the mine has also been already discussed. It is suggested that, until the danger from dust in this mine is considerably reduced, shot-firing should be either discontinued entirely or that the men be withdrawn from the mine during such firing.

A recommendation in regard to the search of the employees, at stated intervals for matches, pipes and tobacco, has I understand, already been made by the coroner's jury, in connection with this disaster. It can be only added that where the personal equation must be so largely a factor in the safety of a mine, too great care cannot be exercised in such a matter as this.

Two further recommendations which do not immediately deal with the safety of the men employed in the mine are suggested. The difficulty arising from the absence of a plan of the ventilation system of a mine, at the enquiry, has already been referred to. And it has been pointed out that under the British Coal Mines Act the operators are required to keep such a plan in their office. It is suggested that a similar provision be inserted in our own Act. The difference of opinion existing in regard to the definition of a district or split has also been referred to. I have already indicated my own view in regard to the question, but it is suggested that a definition of the term be inserted in our Act, so that no difference of opinion can possibly, or at least reasonably, arise.

(Signed), A. A. CARPENTER,
Commissioner.

Calgary, October 20, 1914.

BETWEEN TOWNSHIP LINES

